

$$I^G(J^{PC}) = 0^+(0^-+)$$

Quantum numbers are quark model predictions.

NODE=M059

NODE=M059

NODE=M059M

NODE=M059M

NEW

$\eta_c(2S)$ MASS

VALUE (MeV)	EVTS	DOCUMENT ID	TECN	COMMENT
3639.4\pm1.3 OUR AVERAGE		Error includes scale factor of 1.2. [3638.9 \pm 1.3 MeV OUR 2012 AVERAGE]		
3646.9 \pm 1.6 \pm 3.6	57 \pm 17	ABLIKIM	13K BES3	$\psi(2S) \rightarrow \gamma K_S^0 K^\pm \pi^\mp \pi^+ \pi^-$
3637.6 \pm 2.9 \pm 1.6	127 \pm 18	¹ ABLIKIM	12G BES3	$\psi(2S) \rightarrow \gamma K^0 K \pi,$ $K K \pi^0$
3638.5 \pm 1.5 \pm 0.8	624	² DEL-AMO-SA..11M BABR		$\gamma\gamma \rightarrow K_S^0 K^\pm \pi^\mp$
3640.5 \pm 3.2 \pm 2.5	1201	² DEL-AMO-SA..11M BABR		$\gamma\gamma \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$
3636.1 $^{+3.9+0.7}_{-4.2-2.0}$	128	³ VINOKUROVA 11	BELL	$B^\pm \rightarrow K^\pm (K_S^0 K^\pm \pi^\mp)$
3626 \pm 5 \pm 6	311	⁴ ABE	07 BELL	$e^+ e^- \rightarrow J/\psi (c\bar{c})$
3645.0 \pm 5.5 $^{+4.9}_{-7.8}$	121 \pm 27	AUBERT	05C BABR	$e^+ e^- \rightarrow J/\psi c\bar{c}$
3642.9 \pm 3.1 \pm 1.5	61	ASNER	04 CLEO	$\gamma\gamma \rightarrow \eta_c \rightarrow K_S^0 K^\pm \pi^\mp$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●				
3639 \pm 7	98 \pm 52	⁵ AUBERT	06E BABR	$B^\pm \rightarrow K^\pm X_{c\bar{c}}$
3630.8 \pm 3.4 \pm 1.0	112 \pm 24	⁶ AUBERT	04D BABR	$\gamma\gamma \rightarrow \eta_c(2S) \rightarrow K \bar{K} \pi$
3654 \pm 6 \pm 8	39 \pm 11	⁷ CHOI	02 BELL	$B \rightarrow K K_S K^- \pi^+$
3594 \pm 5		⁸ EDWARDS	82C CBAL	$e^+ e^- \rightarrow \gamma X$

¹ From a simultaneous fit to $K_S^0 K^\pm \pi^\mp$ and $K^+ K^- \pi^0$ decay modes.

² Ignoring possible interference with continuum.

³ Accounts for interference with non-resonant continuum.

⁴ From a fit of the J/ψ recoil mass spectrum. Supersedes ABE,K 02 and ABE 04G.

⁵ From the fit of the kaon momentum spectrum. Systematic errors not evaluated.

⁶ Superseded by DEL-AMO-SANCHEZ 11M.

⁷ Superseded by VINOKUROVA 11.

⁸ Assuming mass of $\psi(2S) = 3686$ MeV.

NODE=M059M;LINKAGE=AB
NODE=M059M;LINKAGE=DE
NODE=M059M;LINKAGE=VA
NODE=M059M;LINKAGE=EB
NODE=M059M;LINKAGE=AU
NODE=M059M;LINKAGE=AR
NODE=M059M;LINKAGE=CH
NODE=M059M;LINKAGE=A

$\eta_c(2S)$ WIDTH

VALUE (MeV)	CL%	EVTS	DOCUMENT ID	TECN	COMMENT
11.3$^{+3.2}_{-2.9}$ OUR AVERAGE		[10 \pm 4 MeV OUR 2012 AVERAGE]			
9.9 \pm 4.8 \pm 2.9		57 \pm 17	ABLIKIM	13K BES3	$\psi(2S) \rightarrow \gamma K_S^0 K^\pm \pi^\mp \pi^+ \pi^-$
16.9 \pm 6.4 \pm 4.8		127 \pm 18	⁹ ABLIKIM	12G BES3	$\psi(2S) \rightarrow \gamma K^0 K \pi,$ $K K \pi^0$
13.4 \pm 4.6 \pm 3.2		624	¹⁰ DEL-AMO-SA..11M BABR		$\gamma\gamma \rightarrow K_S^0 K^\pm \pi^\mp$
6.6 $^{+8.4+2.6}_{-5.1-0.9}$		128	¹¹ VINOKUROVA 11	BELL	$B^\pm \rightarrow K^\pm (K_S^0 K^\pm \pi^\mp)$
6.3 \pm 12.4 \pm 4.0		61	ASNER	04 CLEO	$\gamma\gamma \rightarrow \eta_c \rightarrow K_S^0 K^\pm \pi^\mp$
● ● ● We do not use the following data for averages, fits, limits, etc. ● ● ●					
< 23	90	98 \pm 52	¹² AUBERT	06E BABR	$B^\pm \rightarrow K^\pm X_{c\bar{c}}$
22 \pm 14		121 \pm 27	AUBERT	05C BABR	$e^+ e^- \rightarrow J/\psi c\bar{c}$
17.0 \pm 8.3 \pm 2.5		112 \pm 24	¹³ AUBERT	04D BABR	$\gamma\gamma \rightarrow \eta_c(2S) \rightarrow K \bar{K} \pi$
<55	90	39 \pm 11	¹⁴ CHOI	02 BELL	$B \rightarrow K K_S K^- \pi^+$
<8.0	95		¹⁵ EDWARDS	82C CBAL	$e^+ e^- \rightarrow \gamma X$

⁹ From a simultaneous fit to $K_S^0 K^\pm \pi^\mp$ and $K^+ K^- \pi^0$ decay modes.

¹⁰ Ignoring possible interference with continuum.

¹¹ Accounts for interference with non-resonant continuum.

¹² From the fit of the kaon momentum spectrum. Systematic errors not evaluated.

¹³ Superseded by DEL-AMO-SANCHEZ 11M.

¹⁴ For a mass value of 3654 \pm 6 MeV. Superseded by VINOKUROVA 11.

¹⁵ For a mass value of 3594 \pm 5 MeV

NODE=M059W

NODE=M059W

NEW

NODE=M059W;LINKAGE=AB
NODE=M059W;LINKAGE=DE
NODE=M059W;LINKAGE=VA
NODE=M059W;LINKAGE=AU
NODE=M059W;LINKAGE=AR
NODE=M059W;LINKAGE=W2
NODE=M059W;LINKAGE=W

$\eta_c(2S)$ DECAY MODES

NODE=M059215;NODE=M059

Mode	Fraction (Γ_i/Γ)	Confidence level
Γ_1 hadrons	not seen	
Γ_2 $K\bar{K}\pi$	(1.9±1.2) %	
Γ_3 $2\pi^+2\pi^-$	not seen	
Γ_4 $\rho^0\rho^0$	not seen	
Γ_5 $3\pi^+3\pi^-$	not seen	
Γ_6 $K^+K^-\pi^+\pi^-$	not seen	
Γ_7 $K^{*0}\bar{K}^{*0}$	not seen	
Γ_8 $K^+K^-\pi^+\pi^-\pi^0$	(1.4±1.0) %	
Γ_9 $K^+K^-2\pi^+2\pi^-$	not seen	
Γ_{10} $K_S^0K^-2\pi^+\pi^- + c.c.$	seen	
Γ_{11} $2K^+2K^-$	not seen	
Γ_{12} $\phi\phi$	not seen	
Γ_{13} $p\bar{p}$	< 2.9 × 10 ⁻⁴	90%
Γ_{14} $\gamma\gamma$	(1.9±1.3) × 10 ⁻⁴	
Γ_{15} $\pi^+\pi^-\eta$	not seen	
Γ_{16} $\pi^+\pi^-\eta'$	not seen	
Γ_{17} $K^+K^-\eta$	not seen	
Γ_{18} $\pi^+\pi^-\eta_c(1S)$	< 25 %	90%

DESIG=1

DESIG=4

DESIG=5

DESIG=16

DESIG=8;OUR EVAL;→ UNCHECKED ←

DESIG=6

DESIG=17

DESIG=9

DESIG=10;OUR EVAL;→ UNCHECKED ←

DESIG=11

DESIG=7

DESIG=18

DESIG=3

DESIG=2

DESIG=12;OUR EVAL;→ UNCHECKED ←

DESIG=13;OUR EVAL;→ UNCHECKED ←

DESIG=14;OUR EVAL;→ UNCHECKED ←

DESIG=15

 $\eta_c(2S)$ PARTIAL WIDTHS

NODE=M059216

 $\Gamma(\gamma\gamma)$ Γ_{14}

VALUE (keV)	DOCUMENT ID	TECN	COMMENT
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NODE=M059W1

NODE=M059W1

••• We do not use the following data for averages, fits, limits, etc. •••

1.3±0.6 ¹⁶ ASNER 04 CLEO $\gamma\gamma \rightarrow \eta_c \rightarrow K_S^0 K^\pm \pi^\mp$

¹⁶ They measure $\Gamma(\eta_c(2S)\gamma\gamma) B(\eta_c(2S) \rightarrow K\bar{K}\pi) = (0.18 \pm 0.05 \pm 0.02) \Gamma(\eta_c(1S)\gamma\gamma) B(\eta_c(1S) \rightarrow K\bar{K}\pi)$. The value for $\Gamma(\eta_c(2S) \rightarrow \gamma\gamma)$ is derived assuming that the branching fractions for $\eta_c(2S)$ and $\eta_c(1S)$ decays to $K_S K\pi$ are equal and using $\Gamma(\eta_c(1S) \rightarrow \gamma\gamma) = 7.4 \pm 0.4 \pm 2.3$ keV.

NODE=M059W1;LINKAGE=AS

 $\eta_c(2S) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma(\text{total})$

NODE=M059218

 $\Gamma(2\pi^+2\pi^-) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ $\Gamma_3\Gamma_{14}/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
<6.5	90	UEHARA	08	BELL $\gamma\gamma \rightarrow \eta_c(2S) \rightarrow 2(\pi^+\pi^-)$

NODE=M059G01

NODE=M059G01

 $\Gamma(K\bar{K}\pi) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ $\Gamma_2\Gamma_{14}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
41±4±6	624	¹⁷ DEL-AMO-SA..11M	BABR	$\gamma\gamma \rightarrow K_S^0 K^\pm \pi^\mp$

NODE=M059G04

NODE=M059G04

¹⁷ Not independent from other measurements reported in DEL-AMO-SANCHEZ 11M.

NODE=M059G04;LINKAGE=DE

 $\Gamma(K^+K^-\pi^+\pi^-) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ $\Gamma_6\Gamma_{14}/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
<5.0	90	UEHARA	08	BELL $\gamma\gamma \rightarrow \eta_c(2S) \rightarrow K^+K^-\pi^+\pi^-$

NODE=M059G02

NODE=M059G02

 $\Gamma(K^+K^-\pi^+\pi^-\pi^0) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ $\Gamma_8\Gamma_{14}/\Gamma$

VALUE (eV)	EVTS	DOCUMENT ID	TECN	COMMENT
30±6±5	1201	¹⁸ DEL-AMO-SA..11M	BABR	$\gamma\gamma \rightarrow K^+K^-\pi^+\pi^-\pi^0$

NODE=M059G05

NODE=M059G05

¹⁸ Not independent from other measurements reported in DEL-AMO-SANCHEZ 11M.

NODE=M059G05;LINKAGE=DE

 $\Gamma(2K^+2K^-) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ $\Gamma_{11}\Gamma_{14}/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
<2.9	90	UEHARA	08	BELL $\gamma\gamma \rightarrow \eta_c(2S) \rightarrow 2(K^+K^-)$

NODE=M059G03

NODE=M059G03

 $\Gamma(\pi^+\pi^-\eta_c(1S)) \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ $\Gamma_{18}\Gamma_{14}/\Gamma$

VALUE (eV)	CL%	DOCUMENT ID	TECN	COMMENT
<133	90	LEES	12AE	BABR $e^+e^- \rightarrow e^+e^-\pi^+\pi^-\eta_c$

NODE=M059G06

NODE=M059G06

$\eta_c(2S) \Gamma(i)\Gamma(\gamma\gamma)/\Gamma^2(\text{total})$

NODE=M059217

 $\Gamma(\bar{p}p)/\Gamma_{\text{total}} \times \Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ $\Gamma_{13}/\Gamma \times \Gamma_{14}/\Gamma$

VALUE (units 10^{-8})	CL%	DOCUMENT ID	TECN	COMMENT
< 5.6	90 ^{19,20,21}	AMBROGIANI 01	E835	$\bar{p}p \rightarrow \gamma\gamma$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
< 8.0	90 ^{19,20,22}	AMBROGIANI 01	E835	$\bar{p}p \rightarrow \gamma\gamma$
< 12.0	90 ^{20,22}	AMBROGIANI 01	E835	$\bar{p}p \rightarrow \gamma\gamma$

NODE=M059G1
NODE=M059G1OCCUR=2
OCCUR=3¹⁹Including the measurements of of ARMSTRONG 95F in the AMBROGIANI 01 analysis.²⁰For a total width $\Gamma=5$ MeV.²¹For the resonance mass region 3589–3599 MeV/ c^2 .²²For the resonance mass region 3575–3660 MeV/ c^2 .NODE=M059G1;LINKAGE=A
NODE=M059G1;LINKAGE=B
NODE=M059G1;LINKAGE=C1
NODE=M059G1;LINKAGE=C2 $\eta_c(2S) \text{ BRANCHING RATIOS}$

NODE=M059220

 $\Gamma(\text{hadrons})/\Gamma_{\text{total}}$ Γ_1/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
not seen	ABREU 98O	DLPH	$e^+e^- \rightarrow e^+e^- + \text{hadrons}$
• • • We do not use the following data for averages, fits, limits, etc. • • •			
seen	²³ EDWARDS 82C	CBAL	$e^+e^- \rightarrow \gamma X$

NODE=M059R1
NODE=M059R1²³For a mass value of 3594 ± 5 MeV

NODE=M059R;LINKAGE=W

 $\Gamma(K\bar{K}\pi)/\Gamma_{\text{total}}$ Γ_2/Γ

VALUE (units 10^{-2})	EVTS	DOCUMENT ID	TECN	COMMENT
$1.9 \pm 0.4 \pm 1.1$	59 ± 12	²⁴ AUBERT 08AB	BABR	$B \rightarrow \eta_c(2S)K \rightarrow K\bar{K}\pi K$
• • • We do not use the following data for averages, fits, limits, etc. • • •				
seen	127 ± 18	ABLIKIM 13K	BES3	$\psi(2S) \rightarrow \gamma K\bar{K}\pi$
seen	39 ± 11	²⁵ CHOI 02	BELL	$B \rightarrow K K_S K^- \pi^+$

NODE=M059R3
NODE=M059R3²⁴Derived from a measurement of $[B(B^+ \rightarrow \eta_c(2S)K^+) \times B(\eta_c(2S) \rightarrow K\bar{K}\pi)] / [B(B^+ \rightarrow \eta_c K^+) \times B(\eta_c \rightarrow K\bar{K}\pi)] = (9.6^{+2.0}_{-1.9} \pm 2.5)\%$ and using $B(B^+ \rightarrow \eta_c(2S)K^+) = (3.4 \pm 1.8) \times 10^{-4}$, and $[B(B^+ \rightarrow \eta_c K^+) \times B(\eta_c \rightarrow K\bar{K}\pi)] = (6.88 \pm 0.77^{+0.55}_{-0.66}) \times 10^{-5}$.²⁵For a mass value of 3654 ± 6 MeV

NODE=M059R3;LINKAGE=AU

NODE=M059R;LINKAGE=W2

 $\Gamma(2\pi^+ 2\pi^-)/\Gamma_{\text{total}}$ Γ_3/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
not seen	UEHARA 08	BELL	$\gamma\gamma \rightarrow \eta_c(2S)$

NODE=M059R01
NODE=M059R01 $\Gamma(\rho^0 \rho^0)/\Gamma_{\text{total}}$ Γ_4/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
not seen	ABLIKIM 11H	BES3	$\psi(2S) \rightarrow \gamma 2\pi^+ 2\pi^-$

NODE=M059R15
NODE=M059R15 $\Gamma(K^+ K^- \pi^+ \pi^-)/\Gamma_{\text{total}}$ Γ_6/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
not seen	UEHARA 08	BELL	$\gamma\gamma \rightarrow \eta_c(2S)$

NODE=M059R02
NODE=M059R02 $\Gamma(K^+ K^- \pi^+ \pi^- \pi^0)/\Gamma(K\bar{K}\pi)$ Γ_8/Γ_2

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
$0.73 \pm 0.17 \pm 0.17$	1201	²⁶ DEL-AMO-SA..11M	BABR	$\gamma\gamma \rightarrow K^+ K^- \pi^+ \pi^- \pi^0$

NODE=M059R21
NODE=M059R21²⁶We have multiplied the value of $\Gamma(K^+ K^- \pi^+ \pi^- \pi^0)/\Gamma(K_S^0 K^\pm \pi^\mp)$ reported in DEL-AMO-SANCHEZ 11M by a factor 1/3 to obtain $\Gamma(K^+ K^- \pi^+ \pi^- \pi^0)/\Gamma(K\bar{K}\pi)$. Not independent from other measurements reported in DEL-AMO-SANCHEZ 11M.

NODE=M059R21;LINKAGE=DE

 $\Gamma(K^*0 \bar{K}^*0)/\Gamma_{\text{total}}$ Γ_7/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
not seen	ABLIKIM 11H	BES3	$\psi(2S) \rightarrow \gamma K^+ K^- \pi^+ \pi^-$

NODE=M059R16
NODE=M059R16 $\Gamma(K_S^0 K^- 2\pi^+ \pi^- + \text{c.c.})/\Gamma_{\text{total}}$ Γ_{10}/Γ

VALUE	EVTS	DOCUMENT ID	TECN	COMMENT
seen	57 ± 17	ABLIKIM 13K	BES3	$\psi(2S) \rightarrow \gamma K_S^0 K^\pm \pi^\mp \pi^+ \pi^-$

NODE=M059R22
NODE=M059R22 $\Gamma(2K^+ 2K^-)/\Gamma_{\text{total}}$ Γ_{11}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
not seen	UEHARA 08	BELL	$\gamma\gamma \rightarrow \eta_c(2S)$

NODE=M059R03
NODE=M059R03

$\Gamma(\phi\phi)/\Gamma_{\text{total}}$ Γ_{12}/Γ

VALUE	DOCUMENT ID	TECN	COMMENT
not seen	ABLIKIM	11H BES3	$\psi(2S) \rightarrow \gamma K^+ K^- K^+ K^-$

NODE=M059R17
 NODE=M059R17

 $\Gamma(\gamma\gamma)/\Gamma_{\text{total}}$ Γ_{14}/Γ

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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• • • We do not use the following data for averages, fits, limits, etc. • • •

$<5 \times 10^{-4}$	90	27 WICHT	08 BELL	$B^\pm \rightarrow K^\pm \gamma\gamma$
not seen		AMBROGIANI	01 E835	$\bar{p}p \rightarrow \gamma\gamma$
<0.01	90	LEE	85 CBAL	$\psi' \rightarrow \text{photons}$

NODE=M059R2
 NODE=M059R2

²⁷ WICHT 08 reports $[\Gamma(\eta_c(2S) \rightarrow \gamma\gamma)/\Gamma_{\text{total}}] \times [B(B^+ \rightarrow \eta_c(2S) K^+)] < 0.18 \times 10^{-6}$ which we divide by our best value $B(B^+ \rightarrow \eta_c(2S) K^+) = 3.4 \times 10^{-4}$.

NODE=M059R2;LINKAGE=WI

 $\Gamma(\pi^+ \pi^- \eta_c(1S))/\Gamma(K\bar{K}\pi)$ Γ_{18}/Γ_2

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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<3.33 90 28 LEES 12AE BABR $e^+ e^- \rightarrow e^+ e^- \pi^+ \pi^- \eta_c$

²⁸ We divided the reported limit by 3 to take into account isospin relations.

NODE=M059R23
 NODE=M059R23

NODE=M059R23;LINKAGE=LE

$\eta_c(2S)$ CROSS-PARTICLE BRANCHING RATIOS

NODE=M059230

$$\Gamma(\eta_c(2S) \rightarrow 2\pi^+ 2\pi^-)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\eta_c(2S))/\Gamma_{\text{total}}$$

$$\Gamma_3/\Gamma \times \Gamma_{122}^{\psi(2S)}/\Gamma\psi(2S)$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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<14.6 $\times 10^{-6}$ 90 29 CRONIN-HEN..10 CLEO $\psi(2S) \rightarrow \gamma 2\pi^+ 2\pi^-$

²⁹ Assuming $\Gamma(\eta_c(2S)) = 14$ MeV. CRONIN-HENNESSY 10 gives the analytic dependence of limits on width.

NODE=M059R05
 NODE=M059R05

NODE=M059R05;LINKAGE=CR

$$\Gamma(\eta_c(2S) \rightarrow \rho^0 \rho^0)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\eta_c(2S))/\Gamma_{\text{total}}$$

$$\Gamma_4/\Gamma \times \Gamma_{122}^{\psi(2S)}/\Gamma\psi(2S)$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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<12.7 $\times 10^{-7}$ 90 ABLIKIM 11H BES3 $\psi(2S) \rightarrow \gamma 2\pi^+ 2\pi^-$

NODE=M059R18
 NODE=M059R18

$$\Gamma(\eta_c(2S) \rightarrow 3\pi^+ 3\pi^-)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\eta_c(2S))/\Gamma_{\text{total}}$$

$$\Gamma_5/\Gamma \times \Gamma_{122}^{\psi(2S)}/\Gamma\psi(2S)$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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<13.2 $\times 10^{-6}$ 90 30 CRONIN-HEN..10 CLEO $\psi(2S) \rightarrow \gamma 3\pi^+ 3\pi^-$

³⁰ Assuming $\Gamma(\eta_c(2S)) = 14$ MeV. CRONIN-HENNESSY 10 gives the analytic dependence of limits on width.

NODE=M059R06
 NODE=M059R06

NODE=M059R06;LINKAGE=CR

$$\Gamma(\eta_c(2S) \rightarrow K^+ K^- \pi^+ \pi^-)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\eta_c(2S))/\Gamma_{\text{total}}$$

$$\Gamma_6/\Gamma \times \Gamma_{122}^{\psi(2S)}/\Gamma\psi(2S)$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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<9.6 $\times 10^{-6}$ 90 31 CRONIN-HEN..10 CLEO $\psi(2S) \rightarrow \gamma K^+ K^- \pi^+ \pi^-$

³¹ Assuming $\Gamma(\eta_c(2S)) = 14$ MeV. CRONIN-HENNESSY 10 gives the analytic dependence of limits on width.

NODE=M059R07
 NODE=M059R07

NODE=M059R07;LINKAGE=CR

$$\Gamma(\eta_c(2S) \rightarrow K^{*0} \bar{K}^{*0})/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\eta_c(2S))/\Gamma_{\text{total}}$$

$$\Gamma_7/\Gamma \times \Gamma_{122}^{\psi(2S)}/\Gamma\psi(2S)$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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<19.6 $\times 10^{-7}$ 90 ABLIKIM 11H BES3 $\psi(2S) \rightarrow \gamma K^+ K^- \pi^+ \pi^-$

NODE=M059R19
 NODE=M059R19

$$\Gamma(\eta_c(2S) \rightarrow K^+ K^- \pi^+ \pi^- \pi^0)/\Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma\eta_c(2S))/\Gamma_{\text{total}}$$

$$\Gamma_8/\Gamma \times \Gamma_{122}^{\psi(2S)}/\Gamma\psi(2S)$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
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<43.0 $\times 10^{-6}$ 90 32 CRONIN-HEN..10 CLEO $\psi(2S) \rightarrow \gamma K^+ K^- \pi^+ \pi^- \pi^0$

³² Assuming $\Gamma(\eta_c(2S)) = 14$ MeV. CRONIN-HENNESSY 10 gives the analytic dependence of limits on width.

NODE=M059R08
 NODE=M059R08

NODE=M059R08;LINKAGE=CR

$$\Gamma(\eta_c(2S) \rightarrow K^+ K^- 2\pi^+ 2\pi^-) / \Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \eta_c(2S)) / \Gamma_{\text{total}}$$

$$\Gamma_9 / \Gamma \times \Gamma_{122}^{\psi(2S)} / \Gamma_{\psi(2S)}$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<9.7 \times 10^{-6}$	90	33 CRONIN-HEN..10	CLEO	$\psi(2S) \rightarrow \gamma K^+ K^- 2\pi^+ 2\pi^-$
33 Assuming $\Gamma(\eta_c(2S)) = 14$ MeV. CRONIN-HENNESSY 10 gives the analytic dependence of limits on width.				

NODE=M059R09
NODE=M059R09

NODE=M059R09;LINKAGE=CR

$$\Gamma(\eta_c(2S) \rightarrow K_S^0 K^- 2\pi^+ \pi^- + \text{c.c.}) / \Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \eta_c(2S)) / \Gamma_{\text{total}}$$

$$\Gamma_{10} / \Gamma \times \Gamma_{122}^{\psi(2S)} / \Gamma_{\psi(2S)}$$

VALUE (units 10^{-6})	CL% EVTS	DOCUMENT ID	TECN	COMMENT
$7.03 \pm 2.10 \pm 0.7$	60	ABLIKIM	13K BES3	$\psi(2S) \rightarrow \gamma K_S^0 K^- 2\pi^+ \pi^- + \text{c.c.}$

NODE=M059R10
NODE=M059R10

• • • We do not use the following data for averages, fits, limits, etc. • • •

< 15.2	90	34 CRONIN-HEN..10	CLEO	$\psi(2S) \rightarrow \gamma K_S^0 K^- 2\pi^+ \pi^- + \text{c.c.}$
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34 Assuming $\Gamma(\eta_c(2S)) = 14$ MeV. CRONIN-HENNESSY 10 gives the analytic dependence of limits on width.

NODE=M059R10;LINKAGE=CR

$$\Gamma(\eta_c(2S) \rightarrow \phi \phi) / \Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \eta_c(2S)) / \Gamma_{\text{total}}$$

$$\Gamma_{12} / \Gamma \times \Gamma_{122}^{\psi(2S)} / \Gamma_{\psi(2S)}$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<7.8 \times 10^{-7}$	90	ABLIKIM	11H BES3	$\psi(2S) \rightarrow \gamma K^+ K^- K^+ K^-$

NODE=M059R20
NODE=M059R20

$$\Gamma(\eta_c(2S) \rightarrow \pi^+ \pi^- \eta) / \Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \eta_c(2S)) / \Gamma_{\text{total}}$$

$$\Gamma_{15} / \Gamma \times \Gamma_{122}^{\psi(2S)} / \Gamma_{\psi(2S)}$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<4.3 \times 10^{-6}$	90	35 CRONIN-HEN..10	CLEO	$\psi(2S) \rightarrow \gamma \pi^+ \pi^- \eta$

NODE=M059R11
NODE=M059R11

35 Assuming $\Gamma(\eta_c(2S)) = 14$ MeV. CRONIN-HENNESSY 10 gives the analytic dependence of limits on width.

NODE=M059R11;LINKAGE=CR

$$\Gamma(\eta_c(2S) \rightarrow \pi^+ \pi^- \eta') / \Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \eta_c(2S)) / \Gamma_{\text{total}}$$

$$\Gamma_{16} / \Gamma \times \Gamma_{122}^{\psi(2S)} / \Gamma_{\psi(2S)}$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<14.2 \times 10^{-6}$	90	36 CRONIN-HEN..10	CLEO	$\psi(2S) \rightarrow \gamma \pi^+ \pi^- \eta'$

NODE=M059R12
NODE=M059R12

36 Assuming $\Gamma(\eta_c(2S)) = 14$ MeV. CRONIN-HENNESSY 10 gives the analytic dependence of limits on width.

NODE=M059R12;LINKAGE=CR

$$\Gamma(\eta_c(2S) \rightarrow K^+ K^- \eta) / \Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \eta_c(2S)) / \Gamma_{\text{total}}$$

$$\Gamma_{17} / \Gamma \times \Gamma_{122}^{\psi(2S)} / \Gamma_{\psi(2S)}$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<5.9 \times 10^{-6}$	90	37 CRONIN-HEN..10	CLEO	$\psi(2S) \rightarrow \gamma K^+ K^- \eta$

NODE=M059R13
NODE=M059R13

37 Assuming $\Gamma(\eta_c(2S)) = 14$ MeV. CRONIN-HENNESSY 10 gives the analytic dependence of limits on width.

NODE=M059R13;LINKAGE=CR

$$\Gamma(\eta_c(2S) \rightarrow \pi^+ \pi^- \eta_c(1S)) / \Gamma_{\text{total}} \times \Gamma(\psi(2S) \rightarrow \gamma \eta_c(2S)) / \Gamma_{\text{total}}$$

$$\Gamma_{18} / \Gamma \times \Gamma_{122}^{\psi(2S)} / \Gamma_{\psi(2S)}$$

VALUE	CL%	DOCUMENT ID	TECN	COMMENT
$<1.7 \times 10^{-4}$	90	38 CRONIN-HEN..10	CLEO	$\psi(2S) \rightarrow \gamma \pi^+ \pi^- \eta_c(1S)$

NODE=M059R14
NODE=M059R14

38 Assuming $\Gamma(\eta_c(2S)) = 14$ MeV. CRONIN-HENNESSY 10 gives the analytic dependence of limits on width.

NODE=M059R14;LINKAGE=CR

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NODE=M059

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